



## Implication of global environmental changes on chemical toxicity-effect of water temperature, pH, and ultraviolet B irradiation on acute toxicity of several pharmaceuticals in *Daphnia magna*

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### Abstract:

Global environmental change poses emerging environmental health challenges throughout the world. One of such threats could be found in chemical safety in aquatic ecosystem. In the present study, we evaluated the effect of several environmental factors, such as water pH, temperature and ultraviolet light on the toxicity of pharmaceutical compounds in water, using freshwater invertebrate *Daphnia magna*. Seven pharmaceuticals including ibuprofen, acetaminophen, lincomycin, ciprofloxacin, enrofloxacin, chlortetracycline and sulfathiazole were chosen as test compounds based on their frequent detection in water. The experimental conditions of environmental parameters were selected within the ranges that could be encountered in temperate environment, i.e., water temperature (15, 21, and 25°C), pH (7.4, 8.3, and 9.2), and UV-B light intensity (continuous irradiation of 15.0  $\mu\text{W}/\text{cm}^2$ ). For acetaminophen, enrofloxacin and sulfathiazole, decrease in water pH generally led to increase of acute lethal toxicity, which could be explained by the unionized fraction of pharmaceuticals. Increase of water temperature enhanced the acute toxicity of the acetaminophen, enrofloxacin and chlortetracycline, potentially due to alteration in toxicokinetics of chemicals as well as impact on physiological mechanisms of the test organism. The presence of UV-B light significantly increased the toxicity of sulfathiazole, which could be explained by photo-modification of this chemical that lead to oxidative stress. Under the UV light, however, acute toxicity of enrofloxacin decreased, which might be due to photo-degradation. Since changing environmental conditions could affect exposure and concentration-response profile of environmental contaminants, such conditions should be identified and evaluated in order to better manage ecosystem health under changing global environment. © 2009 Springer Science+Business Media, LLC.

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### Resource Description

#### Exposure :

weather or climate related pathway by which climate change affects health

Ecosystem Changes, Food/Water Quality, Temperature

**Food/Water Quality:** Chemical

#### Geographic Feature:

resource focuses on specific type of geography

# Climate Change and Human Health Literature Portal

Freshwater

## **Geographic Location:**

resource focuses on specific location

Global or Unspecified

## **Health Impact:**

specification of health effect or disease related to climate change exposure

Health Outcome Unspecified

## **Mitigation/Adaptation:**

mitigation or adaptation strategy is a focus of resource

Adaptation

## **Resource Type:**

format or standard characteristic of resource

Research Article

## **Timescale:**

time period studied

Time Scale Unspecified

## **Vulnerability/Impact Assessment:**

resource focus on process of identifying, quantifying, and prioritizing vulnerabilities in a system

A focus of content